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The result of one application of waste engine oil on honeysuckle in an apple orchard. The oil was applied as a spray on May 22 and the photo was made on July 23. The dark area beneath the tree marks the sprayed area. Unsprayed honeysuckle is seen in the right foreground and a few living shoots that escaped injury are seen near the base of the tree.

Honeysuckle Eradication in Virginia Apple Orchards

By

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HONEYSUCKLE ERADICATION IN VIRGINIA APPLE ORCHARDS

By R. H. Hurt

This bulletin reports a safe and economical method for the eradication of honeysuckle in apple orchards as based on experimental work in the Piedmont section of Virginia during 1924 and 1925.

The common honeysuckle (*Lonicera japonica*) has in resent years come to be a serious pest in Virginia apple orchards, especially in the Piedmont fruit belt where it seems to flourish at its best. The honeysuckle handicaps the cultivation of fruit trees and drains the soil of moisture during dry seasons. It also affords excellent hiding places for mice. In addition to orchards the plant infests cultivated fields, hedges, fence rows, yards, gardens, and waste places generally.

The species is perennial, growing from an extensive root system, and it thrives equally well in shady and sunny places. Its spread may be accomplished in two ways, namely, by the root system and by seed. In cultivating land small pieces of roots are carried from the honeysuckle beds to other parts of the field and become established if sufficient moisture is present. Honeysuckle also spreads from seed being washed or carried by birds to other places. The seed are borne in small black berries which come to maturity in the autumn, and if the spread of seed is to be checked the vines must be killed before the berries are mature.

Since honeysuckle becomes established in poor soil so easily and forms such an extensive root system in a very short time, it is one of the best plants for the protection of railroad embankments, and the extensive spread of this weed along the entire eastern section of the United States has been attributed to its use by the railroads for this purpose.

Experimental Work With Oil Sprays

The experiments presented in this bulletin were undertaken to obtain definite information as to the value of lubricating oils in the eradication of honeysuckle under orchard conditions.

Spraying Experiments in 1924

The first tests were made with waste engine oil on a small bed of honeysuckle at Crozet. The plot received three applications of waste

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engine oil as follows: a heavy application the middle of May, a light application the middle of July, and a light application the following spring (1925). The oil was applied with a small hand sprayer, using the waste oil just as it came from the automobile. The application was made on a hot sunny day in each instance and the foliage and vines were thoroughly coated.

In approximately 48 hours after the first application of oil the foliage and vines were practically killed and within four days the vines were killed to the ground line. As there was a great deal of rain during the summer of 1924, honeysuckle grew quite rapidly and the occasional new shoots that developed after the first application had attained the height of 5 to 6 inches by the time the second application was made. The new shoots were scattering and tender and were readily killed back to the ground with a light application of the oil. The following spring (1925) a few new shoots arose which were easily killed by a light application of waste engine oil. Following the third application the roots sent out no new shoots during the remainder of the season, and the assumption is warranted that complete eradication has been obtained. *

Spraying Experiments in 1925

The experiments of 1925 were conducted in two orchards at Greenwood and one at Crozet. The tests were planned to determine the toxicity of oil emulsions for honeysuckle as compared with that of undiluted oil with the view of reducing the cost of materials if possible. The orchards were owned by Mr. C. P. McCue and Mr. E. E. Rosenkrans. † In the McCue orchard large areas of honeysuckle were sprayed with oil emulsion containing 25, 40 and 66 per cent of lubricating oil made by the cold process which will be discussed later in the bulletin. In the Rosenkrans orchard waste engine oil was used. Power sprayers were used in both orchards. The applications were made with reeds in the McCue orchard and with guns in the Rosenkrans orchard and a very heavy dosage was applied at both orchards. The materials were forced well into the vines to insure thorough coating to the ground line.

Following these applications all of the above-ground parts of the

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*The use of oil applied as a spray or with a sprinkling can has been suggested together with other methods for the eradication of honeysuckle in a pamphlet published by the Bureau of Plant Industry of the U. S. Department of Agriculture, but no details of experimental work were given and the applicability of the method to orchards was problematical. The Indiana Agricultural Experiment Station has used a smudge oil with success in the eradication of wild garlic. See Bull. 176 of that Experiment Station.

†Acknowlegment is made of the courtesy and cooperation of Mr. C. P. McCue and Mr. E. E. Rosenkrans who furnished most of the materials and the equipment for these experiments.

honeysuckle were killed in from 4 to 8 days in every case. As the weather which followed was very dry only a few new shoots made their appearance during the remainder of the season and consequently a second application was not considered necessary. A light application will be needed, however, in the spring of 1926 to kill off new shoots and to completely starve the root system.

In these tests the killing power of the 25 per cent emulsion appeared to be as great as that of emulsions containing 40 and 66 per cent of oil and the efficiency of the undiluted oil was no greater than that of the emulsions. The undiluted waste engine oil and the emulsions of higher concentration killed the foliage and vines in less time than the 25 per cent emulsion, but the final result, the killing of the above-ground parts, was the same.

Tests With Common Salt Used as a Spray

Common salt applied in the dry form has been used for many years to smother out small beds of honeysuckle and other weeds and it has been suggested for honeysuckle eradication applied as a spray. A test of the efficiency of salt solution in comparison with that of oil was made during the summer of 1925.

A solution containing 3 pounds of salt to each gallon of water was applied on honeysuckle with a power sprayer at the McCue orchard. This solution contained a considerable excess of salt above that which goes into solution. The material was, therefore, difficult to handle and hard on the spray machinery. The salt settled to the bottom of the tank and the agitator was powerless to stir it into suspension.

In spite of a very thorough application, the salt solution failed to do more than kill a few of the top leaves that were exposed to the sunshine. It is likely that better results would have been obtained had it rained more following the application and washed the salt to the roots of the plants. Even though it were effective, it is doubtful if salt could be used in apple orchards without material damage to the trees.

The Preparation of Oil Emulsions

The oils which have been used as emulsions in this investigation have been the cheap lubricating oils such as waste engine oil, straw oil, and Diamond paraffin oil. Fuel oil and kerosene oil were also tried but since they were found to be too light to kill the foliage of honeysuckle their preparation as emulsions will not be discussed. Any of the lubricating oils may be used for making emulsions, but the cost of the heavy oils makes it desirable to use the light oils such as straw

or Diamond paraffin. Waste engine oil may be used in the form of an emulsion but it should be allowed to settle and should be strained through burlap before emulsification. Miscible oils may be used in honeysuckle eradication but as these are emulsions and not pure oil they should be used at not less than 35 per cent concentration for good results.

The cold process of emulsifying the oil, with calcium caseinate as the emulsifier, was used in the experimental work, but soap emulsions will work equally well. The formula used for making the emulsion is as follows:

Lubricating oil	2 gallons
Water	1 gallon
Calcium caseinate	4 ounces

In practice a quantity of the stock emulsion is made at one time and the mixing is done in the spray tank. The calcium caseinate is first mixed with a small quantity of water and thoroughly stirred and then added to the rest of the water in the spray tank. After the calcium caseinate solution is thoroughly mixed with the water the oil is added and the mixture is agitated a few minutes before pumping is begun. As it is not necessary to emulsify the oil so thoroughly when sprayed on honeysuckle as when used as a dormant spray, it need not be pumped from the tank to other containers, but may be sprayed back through the nozzles upon itself in the tank. The time required will vary according to the amount of oil but usually from 30 to 40 minutes is required for proper emulsification. The stock solution made according to the above formula contains approximately 66 per cent oil and 33 per cent water. In order to reduce this stock solution to a 25 per cent emulsion add one and two-thirds (1.65) gallons of water for each gallon of stock solution.

Directions for Applying

Where any appreciable amount of spraying is to be done a power sprayer should be used and the emulsion should be applied very thoroughly to all parts of the foliage and vines. A gun with a large hole in the disc is an excellent piece of apparatus to use as it handles the oil emulsions nicely and it is short and easy to handle under apple trees. It is best to begin applying the emulsion near the body of the tree, spraying outward to prevent walking through the sprayed honeysuckle. No injury to the root system of apple trees has ever been noticed, but care should be taken to prevent the emulsion from getting on the body of the tree.

The principle involved in the killing of honeysuckle with oil emulsion is a starvation of the root system following the continued destruc-

tion of foliage. The oil itself does not reach the root system and the small amounts that reach the soil directly are no doubt absorbed by the surface layer and are there decomposed. The grower should bear in mind that it is necessary to destroy and prevent all growth of leaves in order to successfully starve the roots.

At least three applications of oil emulsion of not less than 25 per cent concentration will be required under average conditions. The first application should be made on a warm sunny day not later than the first of June and preferably not later than the middle of May. The emulsion should not be applied during cloudy weather or just before a rain for so long as the oil is in an emulsified state it is miscible with water and can be washed off the leaves and vines. This is the most important and critical application and it should be thoroughly done. The new spring growth which the vines have made at this time has been largely at the expense of the reserve foods stored in the wood of the stems and roots and it is important that leaves be destroyed before they have elaborated new food.

If the first application has been thorough only an occasional new shoot will develop and these will be tender and easily killed. The second application should be made about the middle of July. It need be only a light application and only such vines as were missed with the first application and the new shoots that have formed in the meanwhile need be covered.

The second application will virtually complete the starvation of the roots and the eradication of the honeysuckle, but a third application in May of the following spring should insure complete destruction. This need only be a light application on such new shoots as have appeared by that time.

The amount of oil emulsion required to kill the vines of honeysuckle under an apple tree cannot be stated definitely because the size of the honeysuckle beds varies greatly under different trees. It will require, however, approximately 4 gallons of 25 per cent emulsion for the first application to the average size patch of honeysuckle under a tree, and approximately 2 gallons at each subsequent application, or a total of 8 gallons of emulsion for the three applications. The cost of materials for three applications will vary according to the kind of oil used. Waste engine oil can usually be obtained at filling stations free of charge but it is not available in sufficient quantities to supply any appreciable demand. Straw oil or Diamond paraffin oil may be purchased in quantities at 15 or 16 cents per gallon, and in small lots at about 20 to 21 cents per gallon. At a cost of 16 cents per gallon for oil and of 15 cents per pound for calcium caseinate (the prices paid

for cooperative purchases at Crozet in 1925) the eight gallons of 25 per cent emulsion will cost approximately 36 cents, exclusive of labor. This cost has not been considered excessive by the fruit growers as compared with the benefits obtained, and the method of honeysuckle eradication outlined in the foregoing is being rapidly adopted in the Piedmont section.

Places Other than Apple Orchards

To eradicate honeysuckle in gardens, lawns, along stone fences, and in similar places, make a heavy application of 25 per cent emulsion about the middle of May. In about two months after the first application has been made, or when new growth has attained the height of 4 to 5 inches, set fire to the dead vines. This will clean up the dead vines and will kill the new growth. If new shoots make their appearance the following spring they may be killed by a light application of oil emulsion.

Summary

Successful eradication of honeysuckle in apple orchards has been obtained with spray applications of waste engine oil and with the lighter oils such as straw oil or Diamond paraffin. Emulsions of these oils are as effective as the undiluted oil and a 25 per cent emulsion has proved satisfactory.

Under average conditions three applications of oil emulsion are required. The first is made about the middle of May and not later than the first of June. The second is made about the middle of July, or whenever the new shoots have become 4 or 5 inches long. The third application is made in the following spring. The process is one of starvation and the new growth must be destroyed at stated periods for complete success.

Applications should be made on dry, sunny days since rain may dilute the emulsion and wash it away. An orchard sprayer that develops good pressure should be used and a spray gun is well adapted for use under trees.

In gardens, yards, lawns, and places that may be burned over safely, the second application of oil will not be necessary. In about 6 weeks after the first application, or when new shoots have attained the height of 4 to 5 inches, set fire to the dead vines. The fire will clean up the dead vines and kill off the new growth. Do not ever burn sprayed honeysuckle vines in apple orchards, since apple trees are very easily injured by heat.

The cost of materials is not excessive and good results should be obtained if the applications are thorough and timely.